

Basic Electric and Electronic Engineering

Syllabus Number

2C101

Basic Major Subjects

Elective Requisites 2
credit

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1. Course Description

Electric and electronic engineering are used in every field of technology, and all the people studying science and/or technology should have a basic knowledge and understanding of electric and electronic engineering.

This course consists of lectures in the classroom with exercises dealing with practical problems. Students are expected to acquire the knowledge and techniques related to DP1.

2. Course Objectives

Important contents to be learned in this course are:

1. characteristics of circuit elements: power source, resistance (R), coil (L) and condenser (C)

2. basics of direct current (DC) circuits: Ohm's law, Kirchhoff's rules, principle of superposition, combined resistance

3. basics of alternating current (AC) circuits: cyclic behaviors of voltage and current, impedance of R, L and C

4. calculation of voltages and currents in DC and in AC circuits, resonance circuits

The first objective is to learn and understand the basic knowledge required in dealing with electricity, such as voltage, current, and interaction between electricity and magnetism.

The second objective is to understand how resistances, condensers and coils work in direct current (DC) circuit and alternating current (AC) circuit.

The third objective is that students are able to calculate voltages or currents at various points in electrical circuit.

3. Grading Policy

Grading policy is based on the results of final examination (80%) and on exercise answers at each class (30%).

4. Textbook and Reference

Textbook

Tetsuro Yabu (藪 哲郎) Electric and electronic circuits -- easiest to understand in the world (世界一わかりやすい電気・電子回路)

Koudan publishing Co., ISBN978-4-06-156573-9 (講談社)

Reference

none

5. Requirements (Assignments)

The course requires basic knowledge and understanding of mathematics, especially in derivatives, integrals, trigonometric functions and complex numbers,

6. Note

The contents of this course is necessary for students to understand the contents of other various lectures, exercises and experiments learned and studied in Aerospace Engineering Department.

It is strongly recommended that every student of Aerospace Engineering should take this course.

7. Schedule

- [1] Introduction to direct current (DC) circuits: concept of voltage, current and resistance, electrical units, power source (voltage source), resistance, Ohm's law
- [2] Kirchhoff's current rule and voltage rule, series or parallel connection of resistances, combined resistance, short circuit
- [3] Voltage and current meter, calculation of voltages and currents with Kirchhoff's rules
- [4] Principle of superposition, symbol of grounding, bridge circuit
- [5] Thevenin's theorem, current source, electric power and energy
- [6] Alternating current (AC) elements: resistance (R), coil/inductance (L), and condenser/capacitance (C), right-handed screw rule, Lenz's law, electromagnetic induction
- [7] AC voltage and current, sine wave, period of wave, phase of wave, frequency, angular frequency, amplitude
- [8] Periodic variations of voltage and current at a coil and a condenser (sine wave AC)
- [9] Basics of complex numbers: absolute value and argument (phase), impedance of R, L and C in complex numbers
- [10] Vector diagram, RL series circuit, RC parallel circuit, RLC series/parallel circuit
- [11] Principles and features of series or parallel resonance circuit
- [12] AC electric power (effective power, reactive power, power ratio), effective value of voltage and current
- [13] Frequency characteristics, RC low-pass filter, RC high-pass filter
- [14] Voltage transformer, circuit with both DC and AC current
- [15] Review and exercises, examination